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PREVENTION AND CONTROL OF DECAY IN DWELLINGS[1]

Decay of wood is caused by minute threads (hyphae) of plants known as fungi growing in the wood. The most conspicuous part of these fungi are the fruiting bodies (conks, mushrooms, toadstools, etc.) which liberate spores in the air from which new fungus growths start wherever conditions are favorable.

There are two ways in which fungi can be kept from growing in wood that is not naturally decay resistant: (1) by injecting a preservative into it; surface treatment is not sufficient, and (2) by depriving the decay fungi of water. Wood kept dry is a permanent building material.

Wood must contain more than 20 percent of moisture before fungi can grow in it. This is considerably less moisture than is found in green wood, but it is more than is recommended for wood in a building for reasons other than those associated with decay. There is no form of decay that is really a dry rot. The rot most aptly called "dry rot" is limited to that caused by a few fungi which carry the necessary water through rootlike strands from the soil or other source to wood that would otherwise be too dry for fungus growth.

Prevention of Decay in New Buildings

The cardinal principles of good building practice to avoid decay can be summarized in the following rules:

1. Build on a well-drained site. This requires the avoidance not only of marshy locations where the water table is at or near the surface, but also of the more common error of poor grading which, especially in the case of houses without basements, causes drainage from the home site or from surrounding areas to seep under the house. Rain water and melting snow should be drained from the building and the drainage of the general area should be sufficient to keep the ground beneath and around the structure dry. Moisture sources, such as fish ponds, close to the house, should be recognized as dangerous.

2. From lumberyards where the stock is kept off the ground and protected from rain, select only decay-free lumber that is dry, and keep it dry between delivery and installation. Lumberyards should deliver lumber at the building site at such a moisture content as to prevent decay and give minimum trouble from shrinking and swelling after installation. Once delivered, lumber is often handled with an apparent disregard not only of its value but also of the swelling, shrinking, and

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[1] See also Technical Note 242.

decay that may result if it is allowed to become wet. During temporary storage on the building site, all lumber should be protected from rain or other moisture sources and should never be piled directly on the ground. For the parts of the building in which the decay hazard is high, select the heartwood of decay-resistant species, such as baldcypress, cedar, or redwood, or use wood that has been properly treated with a good preservative.

3. Maintain sanitary conditions with respect to foundation, basement, and masonry. All wood scrap and debris that might furnish food for fungi should be removed. A tree stump left beneath a building without a basement has been known to furnish an entrance point for fungus infection resulting in hundreds of dollars worth of damage to floors and woodwork. For the same reason, all concrete forms and form stakes should be removed.

If dirt-filled porches or terraces are used, the wooden sill back of the fill should be completely isolated from the soil by a noncorrosive metal flashing extending between the sill and the foundation upon which it rests, bent upwards over the outside face of the sill, and extending upwards beyond the porch floor and under the siding or other surfacing of the building.

4. As a rule, place no untreated wood within 18 inches of the ground. The wide variations in temperature, rainfall, prevalence of extremely destructive fungi, and availability of the more decay-resistant woods in different sections of the country permit considerable latitude in the application of this rule with respect to contact with the ground. In warm, humid regions, 18 inches may not be enough. In the colder and drier parts of the country, however, wood may be placed considerably closer to the ground. The 18-inch clearance should always be observed, however, unless ample local experience over a long period has definitely demonstrated that there is no risk in violating it. In some localities, so far as decay is concerned, buildings may be safely supported on piers or posts of decay-resistant wood, such as the heartwood of baldcypress, cedar, or redwood, if they are provided with concrete footings extending above the soil. Whenever there is uncertainty as to the safety of using unprotected material in any particular location in a building, the lumber should be thoroughly impregnated with a suitable preservative.

Although decay does not always follow, it is bad practice to lay a wood floor or any untreated wood directly on a brick, cinder, or concrete base at or below the soil grade line, because the wood may absorb sufficient moisture to bring about rapid decay. Good practice necessitates treating the floor sleepers with a preservative; any concrete subfloor should be thoroughly dried before the wood floor is laid. As a further precaution the concrete or other base should be waterproofed.

Partition plates, stair carriages, and wood pillars should be on concrete bases and preferably separated from the concrete by some water-resisting material, such as roofer's felt mopped on with asphalt.

Similarly, embedding the ends of girders in masonry or concrete walls is not good practice unless the point of contact is well above the outside grade line so that the wall does not become damp and transmit

dampness to the wood. Where necessary to seal wood in a wall close to the grade line, preservative-treated wood or all-heartwood stock of a naturally decay-resistant wood should be used.

5. Beneath all buildings that are not provided with basements or in which the basements are so damp that exposed woodwork will absorb considerable quantities of moisture from the air, provide adequate cross ventilation so that no dead air pockets exist. Buildings without basements should be supported on foundations of adequate height with at least 2 square feet of openings per 25 linear feet, to insure ample air circulation. The ventilators may be grilled holes left in otherwise solid foundations, latticed brick in brick walls, unenclosed or wood-latticed spaces between supporting masonry piers or between the ends of floor joists above the foundation plate. Dense bushes or other plants should not be placed directly in front of ventilators, as they will greatly reduce the effectiveness of these openings. In cold climates it is desirable to install special vents which may be closed during the winter months to avoid unnecessary cooling of the ground floor. However, the vents should always be opened in the spring. Porches elevated above the ground should be so built as to insure ample circulation of air beneath them.

6. Make all exterior joints tight enough to keep moisture from accumulating in the adjacent wood. The most critical places are at the corners of the building, and around windows, doors, and porches. Unless shutters and garage doors are made from naturally decay-resistant heartwood or properly preserved wood, avoid outside battens and cross rails, which frequently create decay hazards. Provide drainage through bases of porch columns and at the bottom rails of porch screens to avoid trapping water behind these members.

In general, architectural frills or novel forms of construction should be studied carefully to determine whether they provide entrance points or pockets in which moisture may remain long enough to make wood susceptible to decay. Avoid all forms of construction that will trap moisture in the wood.

7. Avoid the accumulation of moisture condensed from the atmosphere. In many parts of the United States, the water vapor in the air within the walls of a house may condense on the back of the sheathing or the under side of the roof during cold weather and even freeze there. When this happens, more water vapor moves into the wall space from within the house, and this, in turn, is condensed until, if the process is continued long enough, the amount of moisture taken up by the wood may be sufficient to permit decay as well as to cause swelling and paint difficulties. This condition will be aggravated if the air in the house is artificially humidified and if the walls are insulated.

The most positive and least expensive method of preventing condensation within the wall structure of new houses is the use of vapor-resistant barriers at or near the inner face of the wall. Among the materials that are highly resistant to the passage of water vapor are: (1) light-weight asphalt roofing materials; (2) asphalt-impregnated and surface-coated sheathing paper, glossy surfaced, weighing 35 to 50

pounds per roll of 500 square feet; (3) laminated paper made of two or more sheets of kraft paper cemented together with asphalt, 30-60-30 grade; and (4) double-faced reflective insulation mounted on paper.

In houses already erected, painting the inner plastered surfaces of exterior walls with aluminum paint will provide a moisture barrier, although not quite so effectively as the use of the papers recommended for new construction.

During warm, humid weather, there may be so much condensation of moisture on cold-water pipes that a considerable quantity of water drips on the woodwork. This may raise the moisture content of the wood to such a point that the wood is liable to serious localized decay. Such difficulty may be avoided either by insulating the cold surfaces or by making some provision for preventing the condensed moisture from reaching the wood. During cold weather, water may condense on window panes in sufficient quantity to run down over the sash or sills and soak into the wood. The installation of storm windows will greatly reduce the danger of decay in such cases. Reduction of the humidity within the building will also help materially. Chemically treated sash is available and should be used unless the sash can be kept dry.

Repair of Decayed Buildings

In repairing a building damaged by decay the primary job is to determine the source of the moisture and remove it. Ordinarily, if adequate ventilation and soil drainage are provided and if all contacts of untreated wood with the soil or moist concrete or masonry are broken, the decayed wood will dry out and further decay will be prevented. In making replacement, it is a good plan to cut out at least a foot beyond the rotten area because wood is usually infected beyond the point where the rot is apparent. New, green, untreated lumber should never be nailed against old infected material, since this exposes the new wood to immediate attack, with the result that decay may be much more rapid than it was in the original construction. Because of the need for effectively remedying causes of decay that may be inherent in the form of construction used, the replacement of decayed parts of a structure frequently should assume the character of a remodeling job to provide more ventilation or otherwise improve on the original design, rather than superficial replacement of decayed lumber.

Space is not available here to discuss the preservative treatment of lumber, but it should perhaps be pointed out that maximum protection is obtained only from the use of wood pressure-impregnated with a good preservative and that considerably less protection against decay results from brush treating, spraying, or soaking. It is practically useless to brush or spray a preservative over lumber that is in place in a building. Lumber that is to be framed or cut after treatment would necessarily have to be treated through and through or the cut parts retreated for maximum protection; otherwise the exposure of untreated wood in the cutting of the lumber provides ample opportunity for the entrance of decay.